

Quercetin and Blood Oxidative Stress During Ultra-Marathon Running

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Abstract

Previous research indicates that prolonged exercise bouts result in blood oxidative stress. We investigated the efficacy of oral quercetin supplementation, a compound with known antioxidant properties, as a potential countermeasure against blood oxidative stress during ultra marathon exercise. In double blind fashion, 63 subjects received either oral quercetin (250 mg, 4x/day; 1000 mg/day total) or placebo 3-weeks prior to and during the Western States 100 mile trail run. Blood drawn before and immediately following (quercetin finishers n=18, placebo finishers n=21) the event was analyzed for markers of oxidative stress. Results show that in response to the ultra-marathon challenge, aqueous phase antioxidant capacity (ferric reducing ability of plasma, FRAP) was similarly elevated in runners from both quercetin and placebo treatments and likely reflects significant increases in plasma urate levels. Alternately, trolox equivalent antioxidant capacity (TEAC) was not altered by exercise. Quercetin supplementation did not significantly influence pre-to-post-exercise TEAC levels based on a significance level of $p < 0.05$. These findings indicate that oral quercetin supplementation does not appear to alter the lipid or aqueous phase antioxidant capacity of the blood plasma. Accordingly, quercetin supplementation would not be expected to prevent blood oxidative damage during an ultra-marathon event.



Intro

• Previously, blood oxidative stress has been observed following ultra-marathon running.

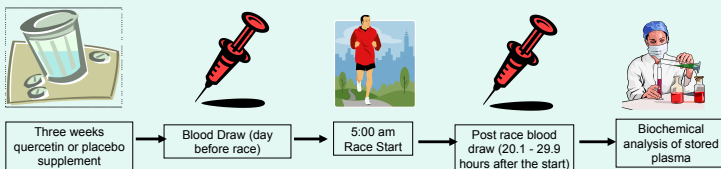
• Ongoing research efforts seek efficacious antioxidant counter therapies for activity-related ox-stress.

• Quercetin, a polyphenolic compound of grapes, is a beneficial intervention in other exercise models.

• The purpose of this study was to investigate the efficacy of quercetin as a potential countermeasure to oxidative stress during ultra-marathon running.



Methods



Results

	Quercetin	Placebo
	n=19	n=22
Males	n=15	n=19
Female	n=4	n=3
Height (cm)	173.3 ± 2.3	177.1 ± 2.1
Weight (kg)	68.3 ± 2.5	74.4 ± 2.3
Years Running	12.6 ± 2.2	13.4 ± 1.6
Miles/Week	51.2 ± 2.9	46.8 ± 4.2
Ultra Marathons	38.7 ± 10.07	38.9 ± 5.81
Finish Time (hours)	26.4 ± 0.6	27.5 ± 0.6

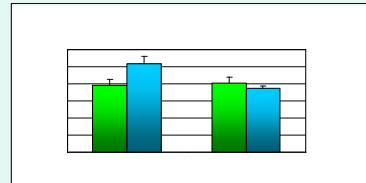


Figure 1. Mass Spectrometry analysis revealed plasma F2-isoprostanes did not differ between quercetin and placebo (pre or post-race), and further, was not affected by ultra-marathon running (interaction effect pre-race, 0.103, post-race $p=0.600$, time effect, $p=0.207$). Values are means ± SEM

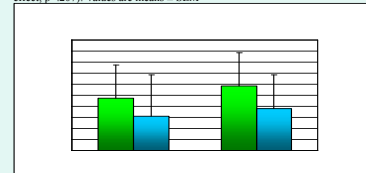


Figure 2. ELISA (Zenith Technology, Dunedin, New Zealand) measurements of plasma protein carbonyls did not differ between quercetin and placebo, and was not affected by ultra-marathon running (interaction effect, $p=0.769$, time effect, $p=0.783$). Values are means ± SEM

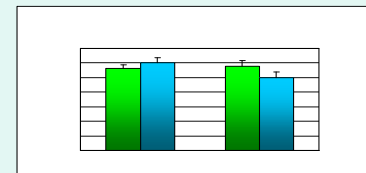


Figure 3. Spectrophotometric analysis of Trolox-Equivalent Antioxidant Capacity (TEAC) did not differ between quercetin and placebo, and was not affected by ultra-marathon running (interaction effect, $p=0.178$, time effect $p=0.289$). Values are means ± SEM

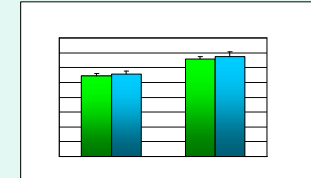


Figure 4. Spectrophotometric analysis of the ferric reducing ability of plasma (FRAP) was significantly affected by ultra-marathon running, but did not differ between quercetin and placebo (interaction effect, $p=0.696$, time effect, $p \leq 0.001$). Values are means ± SEM

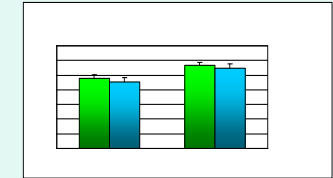


Figure 5. Spectrophotometric analysis of uric acid did not differ between quercetin and placebo, but was significantly affected by ultra-marathon running (interaction effect, $p=0.629$, time effect, $p=0.027$). Values are means ± SEM

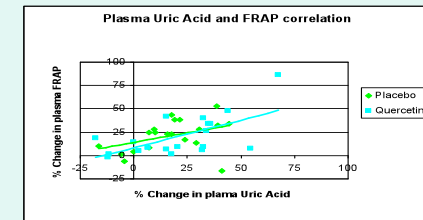


Figure 6. Positive correlations were observed between plasma uric acid and ferric reducing ability of plasma (FRAP). This finding was similar between quercetin and placebo.

Conclusions

- Protein carbonyls, F2-isoprostanes, and trolox equivalent antioxidant capacity (TEAC) were not altered by exercise.
- Aqueous phase antioxidant capacity (ferric reducing ability of plasma, FRAP) was similarly elevated in both quercetin and placebo treatments.
- A positive correlation between plasma uric acid and ferric reducing ability of plasma (FRAP) was observed suggesting that the increased plasma antioxidant capacity may be due to purine metabolism in skeletal muscle.
- Oral quercetin supplementation did not alter the antioxidant capacity of the blood plasma.
- Oral quercetin supplementation would not be expected to prevent blood oxidative damage during ultra-marathon running

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